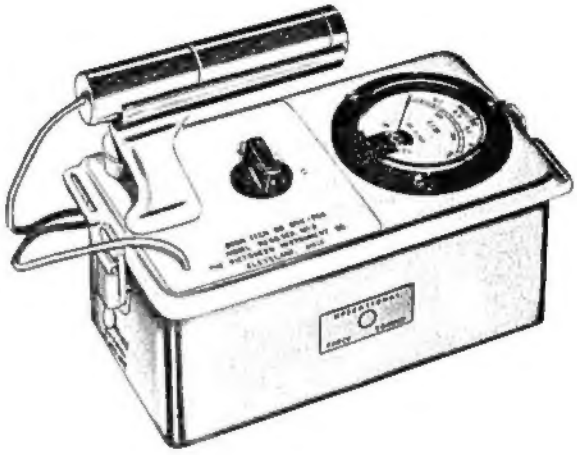
section 6

CD V-700-6B



specifications:

- Ranges: 0-0.5, 0-5, 0-50 mr/hr
- Sensing Element: Geiger Tube
- Accuracy: ±15% of true dose rate from cobalt 60 or cesium 137 gamma radiation
- Batteries: Four 1-1/2 volt NEDA 13
- Dimensions: approx. 8-3/4" long x 4-1/2" wide x 6-3/4" high including handle
- Weight: approx. 4 lbs. including batteries

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GENERAL DESCRIPTION

Introduction

The Victoreen CD V-700 model 6B is a portable geiger counter instrument designed for the detection of low levels of beta and gamma radiation. The geiger tube is mounted in a probe on the end of a thirty-six inch cable. The entire instrument and its accessories include a circuit box, a probe, a headphone, and a carrying strap. A radioactive sample is mounted on the side of the case for checking the operation of the instrument.

Sensing Indicators and Control

A meter with a scale reading in milliroentgens per hour (mR/hr) is used for visual indication, and a headphone is used for aural monitoring. The meter is ruggedized and sealed in a plastic case to meet the instrument requirements for water-tightness, shock and vibration resistance.

The meter is controlled by the range selector switch labeled "OFF, X100, X10, and X1". The range switch changes only the meter ranges. It does not affect the number of "clicks" in the headphone.

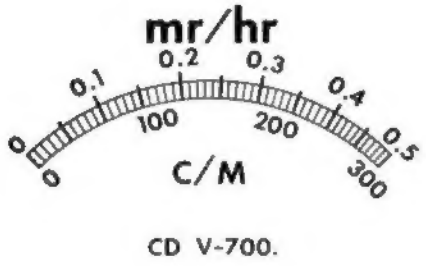
Readings

Table 6-1 lists switch positions and the corresponding meter readings.

Figure 6-1 shows the meter face. Readings should not be taken with the pointer indicating in the lower 10% of the scale. Turn to the next most sensitive range until the pointer indicates in the upper 90% of the scale.

Switch Position	Counts/Minute	mR/hr
X1	0-300	0-0.5
X10	0-3000	0-5.0
X100	0-30,000	0-50

Table 6-1. Switch Positions vs Meter Readings



CD V-700.

Figure 6-1. Meter Face

Initial Check

With the batteries installed, turn the range switch to the X10 position. Close the beta window of the probe. After thirty seconds the circuit should be stabilized and the meter should read zero in the absence of radiation.

Open the beta window on the probe and place the open window on the center of the OPERATIONAL CHECK SOURCE on the side of the instrument. The meter reading should average between 1.5 and 2.5 mR/hr.

Background Count

Normal background radioactivity is about 0.01 to 0.02 mR/hr or about 20 counts per minute. Counts are randomly spaced and several seconds may

elapse before any activity registers on either the meter or the headphone. Accurate measurements of background and other low level radiation can be made by counting the headphone "clicks" against a watch that has a second hand. Note the number of counts occurring in a time period of 5 minutes. Divide the number of counts by 5 and the background count is expressed in terms of counts per minute. More accurate measurements may be made by extending the time period.

Batteries

The CD V-700 model 6B is powered by four 1-1/2 volt "D" size flashlight batteries. The batteries will operate the instrument continuously for over 100 hours and intermittently for over 175 hours. Refer to Appendix A for acceptable types and makes of batteries.

Installation (see figure 6-2)

Open the instrument by lifting the pull catches at each end of the case and separating the two halves to expose the battery compartments and the battery

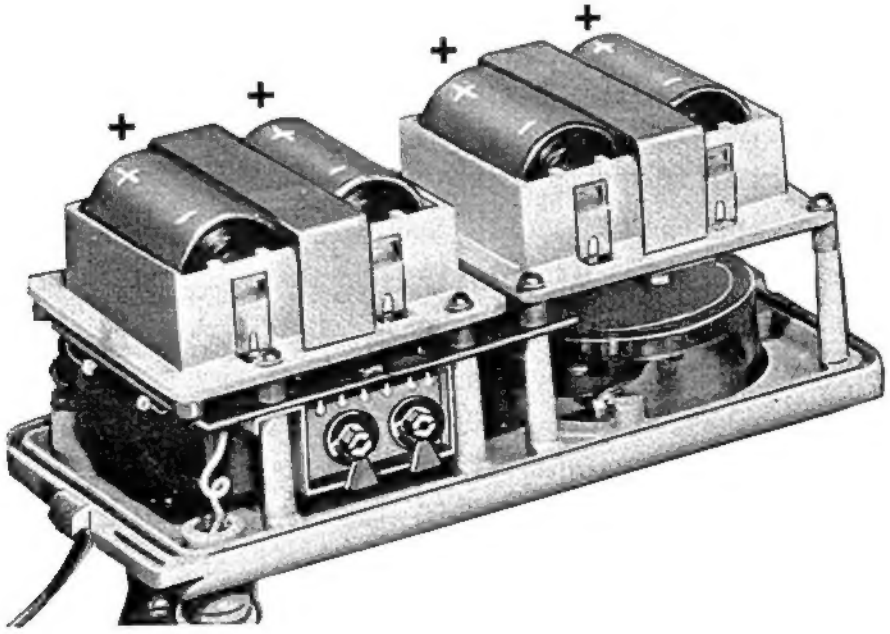


Figure 6-2. Battery Installation

retaining clips. Remove the clips by squeezing the ends and lifting. Insert fresh batteries according to the polarity marked on the inside of the battery compartments. The compartments will not accept batteries with the polarity reversed. Install the battery clips and close the case by aligning the two halves and closing the pull catches.

Replacement

If the instrument fails to operate, check the batteries before attempting to make any repairs or adjustments. The batteries may be checked with a voltmeter while installed in the instrument. With the range switch in the X100 position, the batteries in the front battery compartment should measure at least 1 volt each under load. In the rear compartment, each battery should measure at least 1.25 volts. The batteries may also be removed and tested with a battery tester. It is recommended that all the batteries be replaced at one time to avoid exceeding the shelf life of any one cell.

Electronic Circuitry

All electrical components which make up the circuitry are fastened to a printed circuit board. The circuitry serves to count the geiger tube pulses and to indicate their frequency in terms of dose rate on a calibrated scale.

High Voltage Supply

The high voltage supply required by the geiger tube is a blocking oscillator driven "fly-back" circuit. The blocking oscillator portion of the circuit consists of Q2, R5A, T2 windings 3-4 and 5-6, and batteries BT1 and BT2. When the instrument is turned on, Q2 conducts and an increasing current flows through transformer winding 3-4. The increasing collector current induces a voltage in transformer winding 5-6 which maintains conduction of Q2. The collector current increases until Q2 has sufficient current gain to remain saturated when the circuit rapidly turns off due to the regenerative action of the transformer. During the "turn-off" action, large "fly-back" voltages appear across all transformer windings. A peak voltage of about 1100 volts appears across winding 1-2 because of the large number of turns of wire in the winding. This voltage "fly-back" is rectified by CR3 in a conventional manner.

R9 and C4 filter and smooth the pulsations of voltage across C5. V2 is a corona-discharge regulator tube which maintains the voltage at the proper level for operation of the geiger tube.

Pulse Shaping Circuit

The pulse shaping circuit is a blocking oscillator similar to the power supply, but with some exceptions. The circuit is held "cut-off" by the bias formed by resistors R7 and R8 and the power supply batteries. The blocking oscillator consists of components Q1 and T1. Negative pulses from the geiger tube appear across winding 3-4 of T1. These pulses are coupled into winding 2-5 and into the base circuit of Q1. When Q1 is turned on by the geiger tube pulse, Q1 saturates, and nearly all of the battery voltage of BT3 and BT4 appears across transformer winding 1-6. The winding current increases, and a voltage is induced in transformer winding 2-5. The induced voltage is in a direction such that conduction of Q1 is maintained. The current in transformer winding 2-5 increases linearly until the transformer core saturates. At this time the circuit rapidly turns off, and an inductive "fly-back" voltage appears across both windings.

Metering Circuit

The metering circuit consists basically of diode CR1, integrating capacitor C1, range multiplier resistors R1, R2, and R3, and the meter. Diode CR1 rectifies the "fly-back" voltage induced in the transformer windings and couples it to the meter and capacitor C1. The amount of charge that is placed on C1 during the pulse period of the blocking oscillator is determined by the multiplier resistors. The capacitor is discharged by the meter and R4. R5B is used for calibration.

Audio Circuit

The voltage pulse for the headphone is taken from the "fly-back" of the transformer winding 1-6 through diode CR2. C3 is an integrating capacitor used to stretch the "fly-back" pulse. C2 couples the pulse to the headphone.

SERVICING

Precautions

High Voltage Power Supply

The high voltage supply of the instrument operates in excess of 900 volts. The shock is uncomfortable rather than dangerous but should be avoided. The high voltage components should not be touched even when the instrument is turned off until the high voltage capacitors have been discharged. These capacitors are to be discharged by shorting the voltage regulator tube. Do not short the geiger tube leads since this causes component failure in some models.

Geiger Tube

Care must be exercised not to dent the geiger tube. Dents in the tube may cause arcing at voltages lower than the operating voltages and the tube will be useless. Dropping the tube may cause leakage of the gas mixture.

Semi-Conductor Components (Diodes and Transistors)

The diodes and transistors used in the instrument may be damaged by prolonged heating during soldering. When replacing any of these components, the soldering operation should be done quickly. Hold the lead between the com-

ponent and the joint with a heat sink to decrease the amount of heat transmitted to the component. Techniques are described in section 1 of this Manual. The leads of the high voltage rectifier may break if subjected to strain when removing the component from the circuit board. Use a soldering aid to lift the leads.

Disassembly Instructions

1. Open the pull catches at the ends of the case and remove the instrument from the case bottom.
2. Remove the batteries.
3. Remove the eight screws from the battery compartments. Note that the screw at the rear of the circuit board near the transformer is slightly longer than the others.
4. Remove the range switch knob from the front panel by loosening both set screws.
5. Disconnect the meter by removing the two nuts holding the connecting lugs.
6. Remove the circuit board from the case top by pressing on the range switch shaft. Remove the board slowly since the geiger tube lead and the headphone jack lead are still connected.
7. Reassembly is the reverse of the above process.

Preventive Maintenance

It is recommended that preventive maintenance be carried out once a month when the instrument is in use and once every six months when the instrument is in storage.

1. Remove the batteries, clean the battery contacts and battery terminals if necessary, and remove any corrosion present.
2. Replace all batteries which do not exceed minimum voltages.
3. Perform the Initial Check as described on page 6-2.
4. If the instrument is to be shipped or stored, remove the batteries and set the range switch to one of the sensing ranges. This will shunt the meter and minimize damage from movement of the pointer during shipment or storage.

Do not use solvents on plastic parts. Clean with soap and water. If the batteries have leaked, remove the case bottom and wash it with warm soapy water. The battery spillage will be loosened in a short while and can be rinsed out.

Repairs

Adjusting the High Voltage Power Supply

The special high voltage adjustment on the CD V-700 model 6B permits greater instrument life by compensating for component aging. Whenever fresh batteries are installed in the instrument and the instrument still fails to operate, check the high voltage adjustment. The voltage at test point H should be checked with a high impedance voltmeter (see Appendix B for procedure). If the voltage is too low, adjust the high voltage oscillator as follows:

1. Connect a VOM or a 100 ma panel meter in series with the power supply batteries in the front battery compartment.
2. Turn the high voltage adjustment, R5B, fully clockwise.
3. Turn the range selector switch to X100.
4. Rotate the screwdriver adjustment counterclockwise until the meter reads 33 milliamperes, or until the high voltage output, as measured at point H, is correct.

Replacing the Geiger Tube

1. Grasp the two ends of the probe and twist in a counterclockwise direction to unscrew the tube housing from the socket housing.
2. Insert the new geiger tube into the socket pressing the tube into the socket and against the rubber gasket. Do not handle the thin beta window.
3. Place the tube housing over the geiger tube.
4. Engage the threads of the tube housing and socket housing with a steady pressure against the shock mounting spring and screw together in a clockwise direction. Overtightening may interfere with the operation of the beta shield.

Replacing the Voltage Regulator Tube

The VR tube is held to the circuit board with a rubber grommet and metal clip. To remove the tube, unsolder the leads and press on the top of tube to lift the leads. Twist the tube while pulling it out of the protective grommet. Coat the top half of the new tube with a lubricant such as silicone grease and slide it into the grommet. Connect the cathode to ground and the anode (red dot) to point H. (See figure 6-4) Position the tube so that the leads will not short to the instrument case. Figure 6-3 shows a properly installed regulator tube.

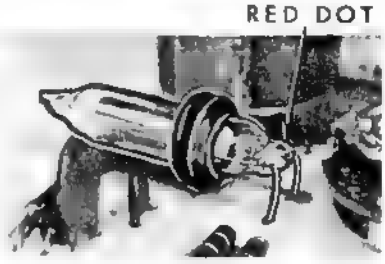


Figure 6-3. VR Tube Placement

Replacing Transformers

The power supply transformer must be removed by drilling out the eyelet holding it to the circuit board. To be sure that transformer replacement will cure the fault, unsolder the leads and substitute another transformer before removing the old one.

The pulse transformer may be removed easily by unsoldering the leads and lifting it from the circuit board.

Replacing the Geiger Probe

1. Remove the rear battery compartment and unsolder the probe leads.
2. Remove the seal nut with an adjustable wrench.
3. Untie the knot and pull the cable through the hole in the case top.
4. Prepare the new cable according to the instructions in section 1 of this Manual.
5. Twist the center conductor and shield together to allow the wire to be inserted through the case top. Pull on the end of the cable with pliers until a sufficient amount extends through the case top.
6. Replace the seal nut and washers on the new cable and tighten the seal nut using moderate pressure. Excessive tightening can damage the cable. Tie a knot in the cable near the seal nut.

7. Connect the cable to the circuit board and replace the battery compartment. The braid is connected to a lug under the handle mounting screw.

Replacing the Switch

1. Follow the Disassembly Instructions through step 6.
2. Heat each switch terminal on the circuit board, one at a time, and press sideways on the switch shaft. This will tend to lift the terminals from the circuit board. Repeat this procedure several times, pushing away from the solder joint each time, until the switch is free.
3. Open the holes on the circuit board with a soldering pencil and soldering aid to allow the switch terminals to be inserted.
4. Insert the new switch and solder each terminal using a minimum amount of heat. Be sure the switch is seated properly so that the shaft will fit through the hole in the case top.

Trouble Shooting

The information in this section is presented as an aid to the service technician in determining the causes of specific instrument faults. The Trouble Shooting Guide lists the most probable causes of instrument failure together with suggestions for corrective action. This should be consulted and followed after the following preliminary steps have been taken:

1. Disassemble the instrument through step 3 of the Disassembly Instructions.
2. Check all batteries. Make sure they provide sufficient voltage for proper operation of the instrument.
3. Check the printed circuit board for broken foil, cold solder joints, or solder bridges.
4. Check for broken components.

Table 6-2, Test Point Chart, and figure 6-4, Location of Test Points, eliminate the need for circuit tracing when making voltage and resistance measurements. The Test Points are referred to in the NOTES column of the Trouble Shooting Guide, and are also found on the schematic circuit diagram.

TROUBLE SHOOTING GUIDE

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Dead	Dead	Geiger tube defective or not compatible with instrument's high voltage	Replace geiger tube or correct instrument's high voltage	Check starting voltage of tube. This must be lower than voltage at point H
		Batteries low or making poor contact	Check batteries and contacts	
		High voltage power supply not properly adjusted	Adjust R5A	Voltage at H=0 or low
		Probe shield shorting to high voltage power supply	Dress leads	Voltage at H=0
		Geiger probe defective	Repair or replace geiger probe	
		CR1 shorted	Replace CR1	
		CR3 defective	Replace CR3	Voltage at H=0 or low
		Q1 defective	Replace Q1	Check Q1 for beta and shorts

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Dead (cont'd)	Dead (cont'd)	Q2 defective	Replace Q2	Voltage at H=0. Check Q2 for beta and shorts. Check T2 before replacing Q2
		T1 defective	Repair or replace T1	Check resistances at C - ▲ B - J H - K
		T2 defective	Repair or replace T2	Check resistances at F - M E - M G - ▲
		C4 shorted	Replace C4	Voltage at H=0 or low
		C5 shorted	Replace C5	Voltage at H=0 or low
		C5 open	Replace C5	Voltage at H low
		Open contact on S1B	Repair switch	Check continuity at D - N
		Open contact on S1C	Repair switch	Check continuity at L - ▲
Dead	Normal	Meter defective	Repair or replace meter	

		Calibration control turned fully counterclockwise	Recalibrate	
		CR1 open	Replace CR1	
		C1 defective	Replace C1	
		Open contact on S1A	Repair switch	Check resistances at A - ▲
Normal	Dead or Weak	Poor connection in headphone plug or jack	Repair connection	
		Headphone defective	Repair or replace headphone	
		CR2 open	Replace CR2	
		C2 open	Replace C2	
		C3 defective	Replace C3	
Upscale	Dead	Q1 defective	Replace Q1	Check Q1 for shorts
		T1 defective	Replace T1	Check resistances at C - ▲ B - J H - K
Upscale	Squeal or Buzz	CR2 defective	Replace CR2	
		Q1 defective	Replace Q1	

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Upscale (cont'd)	Squeal or Buzz (cont'd)	C2 shorted	Replace C2	Symptom appears only when headphone is connected
		C5 open	Replace C5	Check voltage at H. Symptom may cease when voltmeter is connected
		T1 defective	Replace T1	Check resistances at C - ▲ B - J H - K
		T2 defective	Replace T2	
Upscale	Hiss or Click	Probe shield shorted to high voltage power supply	Dress leads	Voltage at H low or intermittent
		Geiger probe defective	Repair or replace geiger probe	Voltage at H low or intermittent
		Geiger tube defective	Replace geiger tube	
		V2 defective or not making contact to circuit board	Replace or resolder V2	Voltage at H high
		T2 defective	Repair or replace T2	Voltage at H low or intermittent

Erratic	Normal	C1 open	Replace C1	
		Meter defective	Repair or replace meter	
High or Low	Normal	R5B not adjusted properly	Recalibrate	
		Geiger tube defective or not compatible with instrument's high voltage	Replace geiger tube or correct instrument's high voltage	
		Meter defective	Replace meter	
		CR1 defective	Replace CR1	
		CR3 defective	Replace CR3	Voltage at H low
		Q1 beta low	Replace with transistor having proper gain	
		V2 defective	Replace V2	Voltage at H low
		C1 defective	Replace C1	
		Open contact on S1A	Repair switch	Check resistances at A-▲

Low Voltage - CR_1 or CR_2
" " Shorted Probe cable
" " of 200 T_1
Full scale meter deflection when turned on indicates T_1 defective
Dead Instrument GM Tube defective or Dirty Tube Pronges.
Low Response GM Tube or Meter
High " GM Tube

RESISTANCE CHART

Remove batteries before checking resistances. Values ±20% except as noted.

Component	Points	Range Switch Position	Resistance (ohms)
*S1A and calibration resistors	A - ▲	X100 X10 X1	1900 ±5% 200 ±5% 16.5 ±5%
S1B	D - N	All except OFF	0
S1C	L - ▲	All except OFF	0
T1 1-6 2-5 3-4	C - ▲ B - J H - K	Any Any Any	3.2 36 40
T2	F - M E - M G - ▲	Any Any Any	5 11 4500

*Remove one meter terminal before making this test.

VOLTAGE CHART

Voltages measured with respect to point ▲. Use a 20,000 ohms per volt meter. All values ±20%.

Point	Voltage	Voltmeter Range
H	920	**
D	6	10
J	3.1	10
M	3.0	10

** Use a high impedance voltmeter. See Appendix B.

Table 6-2. Test Point Chart

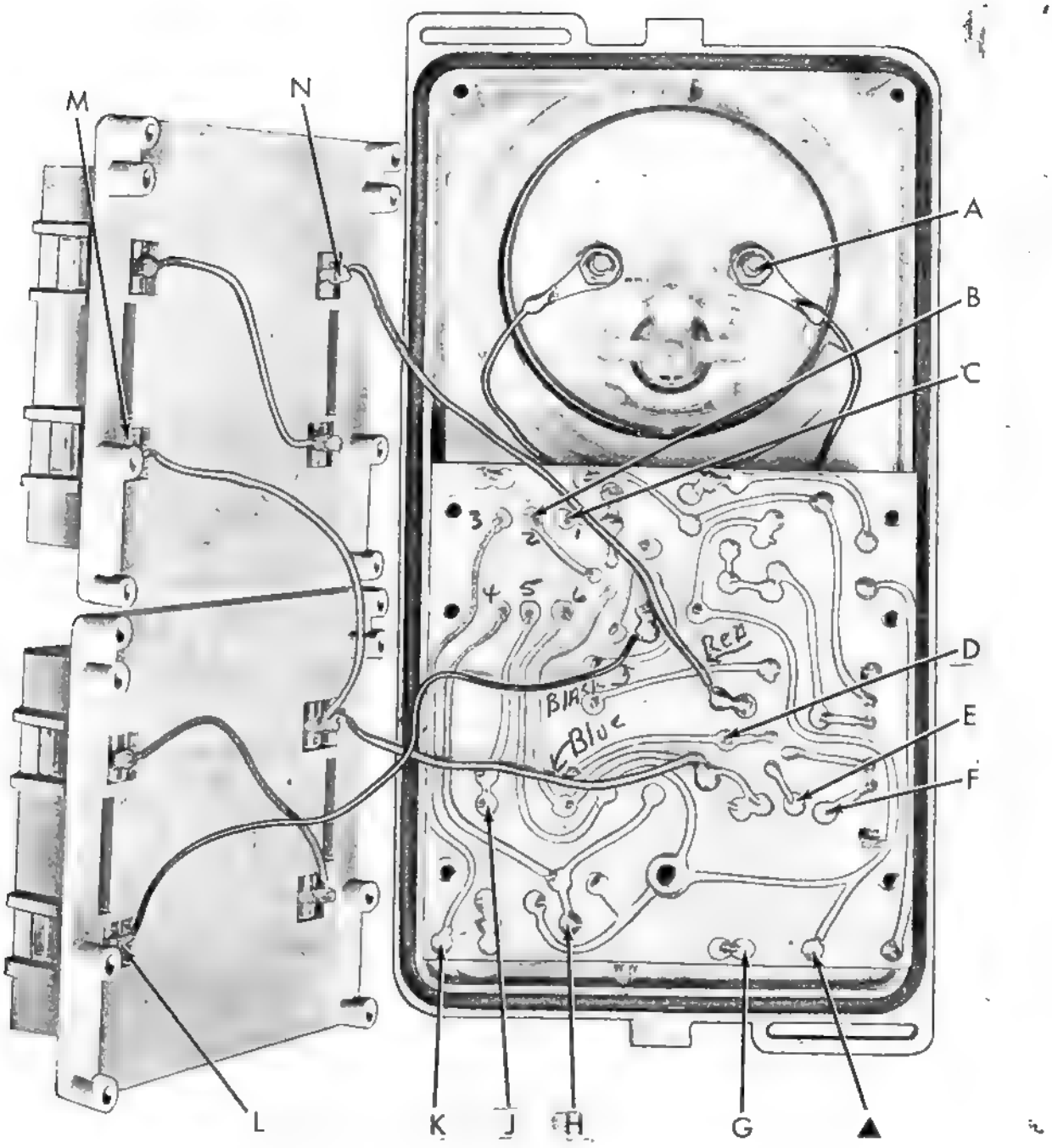


Figure 6-4. Location of Test Points

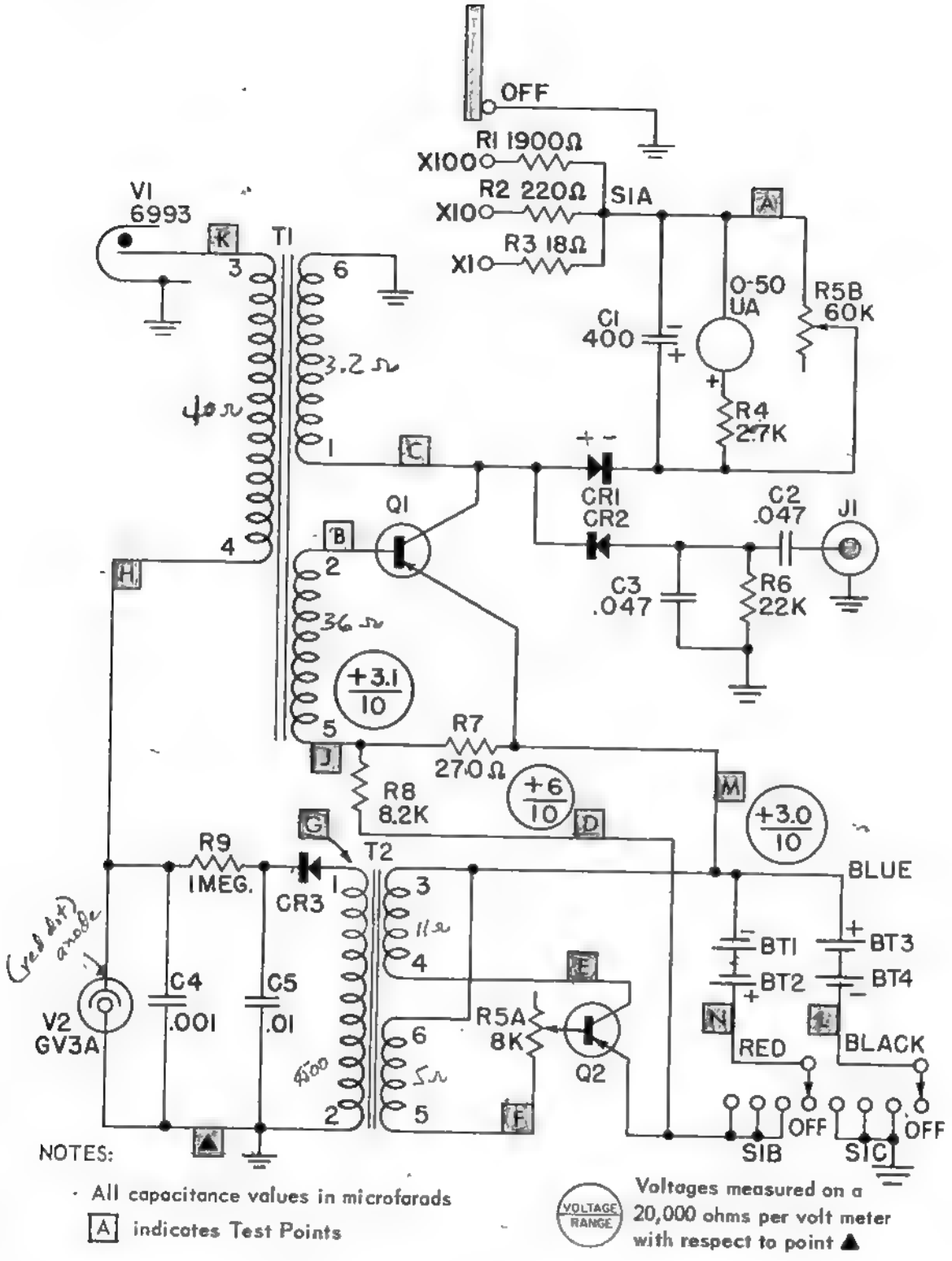


Figure 6-5. Schematic Circuit Diagram

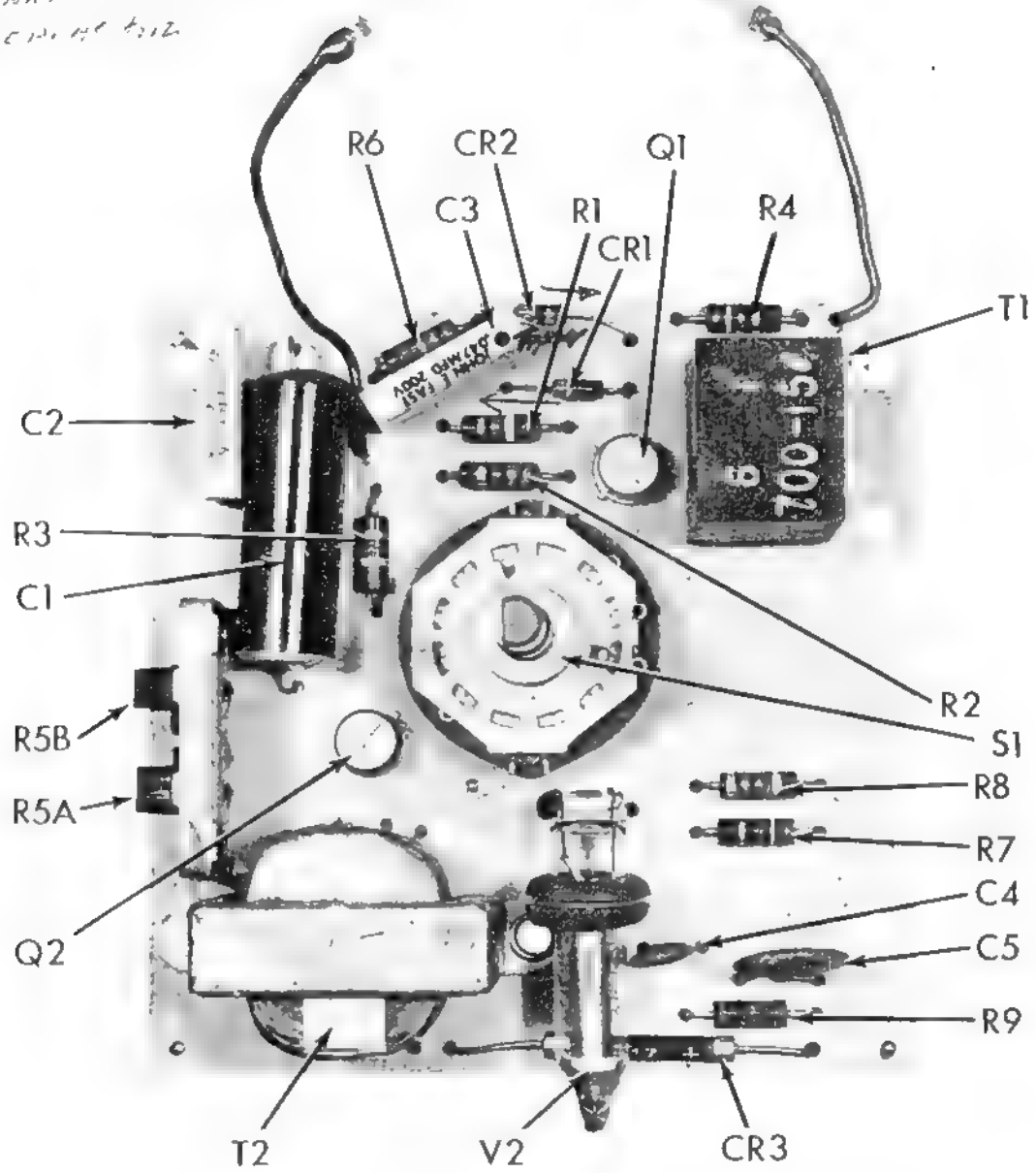


Figure 6-6. Location of Components

Buzz in Instrument - L,
Everything else O.K.

PARTS LIST

Electrical Components

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
BT1	Battery "D" size 1.5V NEDA 13	Power supply battery	Union Carbide 950	16-4
BT2	Battery "D" size 1.5V NEDA 13	Power supply battery	Union Carbide 950	16-4
BT3	Battery "D" size 1.5V NEDA 13	Ratemeter battery	Union Carbide 950	16-4
BT4	Battery "D" size 1.5V NEDA 13	Ratemeter battery	Union Carbide 950	16-4
C1	Capacitor 400 ufd 3V	Integrating capacitor	Nashville Electronics, Inc. 24-500BP400-3D65	21-87
C2	Capacitor 0.047 ufd 50V	Coupling capacitor	John E. Fast Co.	21-390
C3	Capacitor 0.047 ufd 50V	Headphone pulse stretcher	John E. Fast Co.	21-390
C4	Capacitor 0.001 ufd 1000V	By-pass capacitor	Aerovox Corp. 6102624410011420	21-43
C5	Capacitor 0.01 ufd 1600V	Charging capacitor	Electro-Ceramics, Inc.	21-23

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
CR1	Diode, silicon	Meter rectifier	Victoreen Instrument Co. 52-35	52-35
CR2	Diode, germanium	Headphone coupling	Victoreen Instrument Co. 52-1	52-1
CR3	Rectifier, selenium	High voltage rectifier	Electronic Devices, Inc. SQ40HP	489-17
H	Headphone 4K ohms at 1 kc	Aural indicator	Superex Electronics, Inc.	700-16
J1	Phone jack assembly	Headphone connector	Victoreen Instrument Co. 700-102	700-102
M1	Meter assembly 0.50 ua	Visual indicator	Victoreen Instrument Co. 700-95	700-95
2N43 Q1	Transistor, PNP	Ratemeter transistor	Victoreen Instrument Co. 23-17	23-17
2N42 Q2	Transistor, PNP	Power supply transistor	Victoreen Instrument Co. 23-6	23-6
R1	Resistor 1900 ohms 1/2W 5%	X100 range multiplier	International Resistance Co. GBT 1/2	185-1412
R2	Resistor 220 ohms 1/2W 5%	X10 range multiplier	International Resistance Co. GBT 1/2	185-560
R3	Resistor 18 ohms 1/2W 5%	X1 range multiplier	International Resistance Co. GBT 1/2	185-450

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
R4	Resistor 2.7K ohms 1/2W 10%	Meter time constant	International Resistance Co. GBT 1/2	185-252
R5	Potentiometer 8K ohm 60K ohms 30%	———	Centralab Model 5 type 70-2 60K - 8K	22-158
R5A	Dual Potentiometer 8K 30%	Power supply adjust	———	———
R5B	Section of R5 60K 30%	Calibration control	———	———
R6	Resistor 22K 1/2W 20%	Headphone time constant	International Resistance Co. GBT 1/2	185-1365
R7	Resistor 270 ohms 1/2W 10%	1/2 of ratemeter bias	International Resistance Co. GBT 1/2	185-78
R8	Resistor 8.2K 1/2W 10%	1/2 of ratemeter bias	International Resistance Co. GBT 1/2	185-200
R9	Resistor 1 meg 1/2W 20%	Filter resistor	International Resistance Co. GBT 1/2	185-1305
S1	Switch	Range switch	Victoreen Instrument Co. 700-6	700-6
S1A	Section of S1	Range multiplier selector	———	———
S1B	Section of S1	Power supply battery switch	———	———

Circuit Symbol	Description	Function	Manufacturer & Part No.	Victoreen Part No.
S1C	Section of S1	Ratemeter battery switch	———	———
21139 T1	Transformer	Pulse transformer	Victoreen Instrument Co. 700-154	700-154
T2	Transformer	Power supply transformer	Victoreen Instrument Co. 14-32	14-32
V1	Geiger tube 6993	Detecting element	Victoreen Instrument Co. CPO-352	CPO-352
22151 V2	High voltage regulator tube GV3A 900V	Regulates high voltage	Victoreen Instrument Co. CPO-240	CPO-240

Mechanical Components

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Battery compartment (2)	Houses batteries	Victoreen Instrument Co. 700-66	700-66
Battery contact (8)	Electrical connections to batteries	Victoreen Instrument Co. 700-68	700-68
Battery retainer clip (2)	Holds batteries in battery box	Victoreen Instrument Co. 720-121	720-121
Cap plug and chain assembly	Covers phone jack	Victoreen Instrument Co. 700-65	700-65
Case bottom and clamp assembly	Bottom case of instrument	Victoreen Instrument Co. 700-158	700-158
Case gasket	Water seal between case top and case bottom	Victoreen Instrument Co. 720-157	720-157
Case top	Top panel of instrument	Victoreen Instrument Co. 700-162	700-162
Circuit label	Circuit diagram in case bottom	Victoreen Instrument Co. 700-161	700-161
Detent ball	Positions sliding probe shield	New Departure Div. GMC 1/16" ball 44055 Gr. 2	700-89
Detent spring	Holds detent ball in place	Victoreen Instrument Co. 700-171	700-171

Description	Function	Manufacturer & Part No.	Victoreen Part No.
End cap	End cap of probe	Victoreen Instrument Co. 700-78	700-78
Gasket	Seals probe	Victoreen Instrument Co. 700-174	700-174
Grommet	Holds voltage regulator tube	Philpott Rubber Co. GB-225	51-7
Instruction manual (2)	Operating instructions	Victoreen Instrument Co. 700-151	700-151
Knob	Range switch knob	Harry Davies Molding Co. 1500K	9-9
Meter gasket	Water seal between case top and meter	Victoreen Instrument Co. 700-63	700-63
"O" ring	Seals phone jack	Parker Appliance Co. 2-12	46-47
"O" ring	Seals probe stand	Parker Appliance Co. 2-9	46-25
"O" ring	Switch shaft water seal	Parker Appliance Co. 5427-1	46-38
Phone plug	Headphone connection	Zoron Inc. 40121	700-57

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Printed circuit board	Supports components	Victoreen Instrument Co. 700-159	700-159
Probe assembly	Holds geiger tube	Victoreen Instrument Co. 700-175	700-175
Probe clip	Holds probe to case handle	Victoreen Instrument Co. 700-169	700-169
Probe shield retaining spring	Holds probe shield in place	Victoreen Instrument Co. 700-87	700-87
Probe stand handle	Instrument carrying handle; holds probe clip	Victoreen Instrument Co. 700-73	700-73
Rubber gland	Seals probe cable	Victoreen Instrument Co. 700-71	700-71
Seal nut	Clamps probe cable	Victoreen Instrument Co. 700-72	700-72
Shoulder strap	Carrying strap	Victoreen Instrument Co. 700-81	700-81
Strap buckle (2)	Carrying strap length adjustment	Waterbury Buckle Co. 807 5047	710-44
Strap fastener (2)	Attaches shoulder strap to instrument	Victoreen Instrument Co. 700-82	700-82

Description	Function	Manufacturer & Part No.	Victoreen Part No.
Tube clip	Holds voltage regulator tube to circuit board	Victoreen Instrument Co. 700-94	700-94
Washer	Bearing surface	Victoreen Instrument Co. 44-61	44-61